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Rates for Gas Service
By C.L. Cory

UNIVERSITY OF CALIFORNIA
AT LOS ANGELES



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By C. L. CORY

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RATES FOR GAS SERVICE.

BY C. L. CORY.

In all probability more money has been expended in the various States and cities of the Pacific Coast during the past decade, either directly or indirectly, in connection with litigation or other phases in determining the rates for gas service, than has been the cost, in the same territory, of all experimental and other related scientific and engineering work of improving the methods and reducing the cost of the manufacture, distribution and sale of gas. Certainly, there is no problem connected with the gas industries more important than that of rates. There is a spending and receiving side to every organization. It is the difference between what is spent to provide a commodity and the amount for which the commodity in the aggregate is sold which establishes the desirability of the business. Unlimited commendation is due the gas engineers of the Pacific Coast for the work they have done in recent years to improve the processes of gas manufacture, including all of the notable advances in high pressure distribution and improvement of service, as well as the increased economies and reduced cost of production. It is but natural, therefore, that we should be equally interested in the consumption and use and especially the proper rates to be charged for gas, not only from the standpoint of the manufacturing companies, but quite as much must the consumer's position in the matter be given due consideration.

*The term "public utility" has been defined as meaning and embracing each corporation, company, firm, individual and association, such as express, telephone, telegraph, sleeping car, freight-line, equipment, electric light, gas, natural gas, pipe line, water-works, messenger, signal, union depot, water trans-

portation, heating and cooling companies; street, steam, suburban and interurban railroad companies; also any plant or property owned or operated by such companies, corporations, firms, individuals or associations.

It is such companies as above indicated that provide service to the public, and the rates for such service should be based primarily upon the cost of providing adequate and satisfactory service. To determine this cost is many times a difficult task, and especially so when the devices and system required to provide the service are not fully developed and standardized. As an illustration, the rates for freight and passenger service between San Francisco and Los Angeles, whether by steamer or by rail, have been established for such a length of time that it is not a difficult matter to decide upon the reasonableness of such rates, and, therefore, rates may be established that are more or less permanent and not subject to material revision from year to year. However, to determine adequate freight and passenger rates between these cities using the automobile or the aeroplane would be exceedingly difficult, if not impossible. However, it is not to be concluded that in future years, service, both passenger and freight, with the newest aerial devices for transportation may not become so well established, reliable and satisfactory that rates of service might not be readily determined.

The business of manufacturing and supplying gas has been very thoroughly standardized, although progress is constantly being made in the methods of manufacture as well as the increased economies in distribution. High pressure systems have been introduced in recent years. The methods of gas manufacture from California crude oil on the Pacific Coast have been perfected within a comparatively recent date. As compared with many other public utility enterprises, however, the gas business has been established so long that the determination of the cost of service is comparatively easy.

The cost of delivering gas to the consumer necessarily embraces the determination among other things

of a fair valuation of the plant that is devoted to public use, the gross earnings under any given set of rates and the reasonable operating expenses when depreciation of the physical property and adequate returns on the investment are included.

The general information necessary in order to arrive at the proper rate for gas service may, in general, be subdivided as follows:

1st. The valuation or appraisal of the plant used for the manufacture and distribution of gas.

2d. The annual cost of operation, including a complete segregation of all accounts set forth in such a manner as to indicate the different operating costs per 1000 cubic feet of gas manufactured and sold.

3d. A statement of the quantity of gas made and sold for a number of years, preferably not less than five, and the total revenues received each year from the sale of gas.

Valuation.

There are a number of fundamental principles involved in obtaining the valuation of a gas plant and system to be used in determining a proper rate for gas service. It is quite as important that corporations themselves should determine for each year the valuation of the system upon which a return on the investment is to be earned as it is for this valuation to be determined by any public body, whether only incidentally or directly concerned, with the fixing of rates.

The original cost of construction, the cost of reconstruction or reproduction new, the cost of reproduction new less depreciation, the present value, the assets and liabilities taken as a whole, the capitalization, the bonds and stock outstanding, and the gross earnings and operating expenses are all elements that should be considered in determining the valuation of a public utility for rate fixing or other purposes. Each of these elements constitutes evidence of what is a fair value. The original cost, the cost of reproduction new and the present value bear a very close relation to the physical property of the plant and are, therefore, most usually considered of the greatest im-

portance in determining the proper valuation. Which of these three elements gives the best indication of the value will vary in each individual case.

The original cost can, if all records of construction are available, be usually determined by what is known as the historical method. The conditions under which the construction of the system was carried out, whether all done at once or extended from year to year as the growth of the business required, will be covered in this method of determining the original cost. When proper charges only are included and no mistakes have been made, for which the builders may be properly held responsible, the original cost represents the investment that has actually been made in the physical property of the plant.

The rapid growth of many systems, however, and the rapidity with which changes have been made, coupled with inadequate records, make it many times practically impossible to determine the original cost with any degree of reliability. Much depends upon the manner in which accounts and records have been kept. In order to be of value they should show the actual cost of the different parts of the plant, segregating labor and material, the cost of engineering superintendence, management, and administration, the amount that has been allowed as interest on the capital during the construction period, the cost of financing, which will include the discount at which bonds were sold, the basis upon which stock has been issued or sold, all promotion expenses and similar items. It is not difficult to imagine records which would give the above information, but I venture to say that most rare is it that the original cost of a gas plant operating at the present time may be obtained entirely in such a complete and satisfactory manner.

Moreover, the original cost even when determined in full detail may not be the valuation upon which reasonable returns should be allowed. It is a question of equity between owners of the plant on one hand and the customers on the other. The owners are entitled to a reasonable return upon what they have in-

vested, while the customers should not pay rates for service that will yield more than an adequate return upon the investment necessary to supply such service. If the plant has been built when prices were abnormally high and money has been lost through lack of reasonable skill, excessive promotion fees and discounts, private understandings between the builders of the plant and the contractors, the original cost may be decidedly greater than the valuation on which the investors should be allowed to earn.

Conversely, it may be that the plant was constructed when the prices for labor and material were excessively low, or a great portion of the plant may have been obtained through failure of previous owners to successfully carry on the business, due either to temporary financial difficulties or what has been more common, great strides in the method of manufacture, resulting ultimately in foreclosure. In such a case the original cost would hardly be a fair figure upon which to base the valuation for rate fixing purposes, as the foresight and enterprise of the present owners certainly justifies some regard.

The original cost is so rarely available that the cost of reproduction new of the plant usually must be determined. A great deal of engineering knowledge and detail work is necessary to obtain this result. Invariably, a complete inventory of the physical property is the first step required. The only satisfactory inventory is one obtained as a result of actual inspection and enumeration, aided, as much as possible, by all the records available, and supplemented by such additional information as may be had from the various heads of departments and other employees of the company. Such an inventory should include for each different part of the property the amount of labor and material required to provide ready for operation each element of the completed plant. The next step consists in obtaining from all data obtainable a suitable price per unit, not only of each element of the property, but the labor and material required to install the devices in position ready for operation. It is well in determining such unit prices to take a period cov-

ering at least five years and obtain the average in this manner. The total and average cost of the labor and material that has entered into the plant ready for operation is thus obtained.

Inventories.

Inventories of the actual physical property which taken together go to make up a modern gas plant and system should include the following:

Real estate.	Furniture and fixtures.
Buildings.	Automobiles, motorcycles, etc.
Gas works, including holders.	Stable equipment.
Street mains.	Tools.
Services.	Supplies.
Meters, regulators and lamps.	Working capital.

Real Estate.

A complete list of all real estate used wholly or in part for the purpose of the manufacture and the supplying of gas should be included in the inventory. The values placed upon this real estate should be determined in so far as possible by actual sales of property in the vicinity of the real estate in question when used for a similar purpose. The purpose for which the property is used must always be taken into consideration. Disinterested real estate men are usually able to give information leading to a rational decision in such matters. Unfortunately, assessments for taxation purposes are not of material assistance in appraising such real estate. On the other hand the actual figures at which adjacent property is sold are rarely available.

When a gas company has real estate not actually in use but is holding it for future occupancy the question naturally arises should such real estate be included in arriving at the valuation of the plant for the purpose of determining the proper rate for the sale of gas at any given time.

In arriving at a conclusion in this matter, it is best to proceed upon the principle that it is proper to include all property actually required and used in the carrying on of the business at the time in question and not to include such real estate not required or used on the date the valuation is made. However, at some later period when the real estate is actually put

to use and occupied by buildings and equipment, that are a part of the operating system, in arriving at the valuation, there should be added interest and taxes during such time as the investment in such lands has been tied up but not productive. On any other principle, customers of today would pay a rate for service in excess of what they should and customers of the future may pay relatively less and thereby benefit unduly.

Buildings.

All of the buildings owned by the company as a part of its operating system should be included in the inventory and so segregated that it will be possible to separate the structures such as office buildings, etc., from the structures required as a part of the manufacturing plant. This should be done in order to obtain the cost of the manufacture of gas as delivered to the holders separate from the general expenses connected with the operating of the property usually connected with the expense of the general offices of the company. The inventory costs of all buildings are usually best obtained from the plans, specifications and contracts or other records of the company. The condition of the buildings in general usefulness and probable future life should be taken into consideration in determining the probable value based upon original cost, cost of reproduction new and present value.

Gas Works.

The gas works inventory must include besides buildings all of the equipment necessary in the manufacture, metering and storing of gas, such as boilers, blowers, compressors, generators, exhausters, holders, heaters, pumps, piping, purifiers, scrubbers, and miscellaneous equipment. The date of purchase or contract and the date when installation was commenced and completed as well as the type of apparatus and by whom manufactured, should be included as a part of the inventory. When possible, the cost of each element of the entire manufacturing plant ready for operation segregating labor and material is desirable.

Street Mains.

An inventory of street mains is best obtained by tabulating and mapping from work reports all installations and removals for as long a period as records are available. Scaling street mains from maps in order to obtain the aggregate length of the various sizes should only be resorted to when the actual records of installation are not available. The size of all street mains including fittings and accessories of every character and classified as to the material used, such as wrought iron, cast iron or casing, should be included in the inventory. In a similar manner the cost of replacing the street surface in the various kinds of paving should be determined from the most recent records available for such work.

The item of paving in determining the value of underground street mains and services has been variously considered. Every legitimate expenditure in adapting the utility to the progress and community growth, even if this involves the removal of the plant from one locality of the city to a distant and more remote location, is a proper charge to construction. All expenditures for putting down pavement by the company as required by the city or the cost of cutting through such pavement for extensions and construction purposes, and its replacement, are unquestionably proper capital charges. However, it is a question whether a gas company may properly capitalize the expense of municipal betterment which it has not borne and when such benefits to the gas company are only incidental and can only exist from the standpoint of the cost of actually reproducing their underground system, after the street has been paved, when as a matter of fact the existing underground mains and services were laid before the paving was actually put down. The cost of such paving is not a proper element of value when the cost of laying such pavement has not been paid for by the gas company nor any expense incurred therewith, providing of course that all costs borne by the company of changing the grade or depth of underground mains and services, in order

to adapt them to conditions required for paving by the city, are included in the capital account.

Services.

In obtaining the inventory of services, it is most satisfactory to list all services, obtaining thereby the size, length, and character of each service as shown by the records of this department. Only that portion of the service belonging to the company should be included and if consumers have paid for any portion of the service that portion should be considered as belonging to the company. The total value of the services should represent only those actually owned by the company and in general should not include any services or reproduction of any services within customers' premises unless the cost of the same has actually been met by the company.

In order to arrive at a unit cost of services, it is best to obtain the actual labor and material charge for a number of services installed in various parts of the district served and at different seasons of the year, to get a reliable average cost per unit length of service.

Meters, Regulators, Etc.

The inventory of meters in service is usually readily obtained from the company's records. The inventory cost of the meters should include the necessary testing, painting and all storeroom expense. The cost of installing the meters should include all costs from the time the order leaves the general office until the order and record of installation are returned to the general office. The time cards of meter installers covering a considerable period can with great advantage be used to determine the cost of installing meters of different sizes.

Furniture and Fixtures, Automobiles and Motorcycles. Stable Equipment, Tools and Supplies.

Complete inventories should be made of the property owned and in actual use by the company for the carrying on of the business covering all subsidiary items such as furniture and fixtures, automobiles and motorcycles, stable equipment, tools and supplies.

Only those supplies should be included which are active and of the normal quantity carried in stock and necessary for the operation of the company's business.

Working Capital.

A gas plant and system in operation must have working capital as well as fixed capital. Stores and supplies which are included in the fixed capital do not represent all of the working capital such plants require. There must be available a reasonable cash balance and other current allowances in order to operate economically and effectively. Just what sum represents a fair amount for working capital is nearly always a matter of judgment. From the amount of working capital usually carried by such companies and from the amount that is required by other similar public utility corporations, it appears that as an average for the year a sum equalling the accounts receivable and cash on hand less the accounts payable and consumers advance payments is a reasonable allowance. The cash on hand, however, should be considered as that which is ordinarily required for the operation of the plant and the conduct of the business, including contingencies and emergencies, and should not include the capital or ready cash necessary for the construction of extensions or enlargement of the plant, or balances resulting from the sale of bonds or stock or in any case exceed the amount normally needed and used by the company as an operating property.

Such an inventory coupled with what might be called the inventory costs serves to obtain the detailed and segregated costs of the various elements going to make up the physical property of the plant. In addition in order to estimate the total valuation it is necessary to ascertain as nearly as may be the time required for construction in order that interest upon the investment during the construction period may be estimated. The cost of engineering, supervision, fire and casualty insurance, administration, legal expenses and other factors must also be obtained, preferably from the actual working conditions during which recent construction work was carried out.

Taken together the cost of reproduction new of the physical plant is usually considered to be the sum of the elements above enumerated. The cost of reproduction new has been variously interpreted, sometimes erroneously, especially when it has been held to mean a system identical with the one the valuation of which is under consideration. Properly, it should be understood as a plant of similar character and equal efficiency. The age of the system will have much to do in indicating the fairness with which the cost of reproduction new is considered.

It will depend upon conditions as to whether the cost of production new and the original cost very materially. One of the principal differences which will be found will be in the size and capacity and number of units in the two cases. Gas plants are probably never built in a single year, nor used exactly as they were originally constructed for a number of years. The original cost will probably properly cover the plants as installed with small units, while the cost of reproduction new may be considered to cover only the cost of a smaller number of much larger units having the same aggregate capacity. Especially would this difference arise in connection with the distribution system, both mains and services. Originally one single main on one side of the street of comparatively small size may have been adequate to provide gas service in that particular vicinity. Later on it became necessary to lay an additional gas main many times larger than the original and as is often the case this later main is laid upon the opposite side of the street, resulting in the cutting of all services leading to property on the side of the street where the new main is laid and the connection of those services into the new main, instead of the old. As viewed from present requirements, one gas main alone might be considered in obtaining the cost of reproduction new, while the actual cost would necessarily be greater.

Depreciation in Its Relation to Valuation.

While the original cost as well as the cost of reproduction new are ordinarily of the greatest import-

ance in determining the proper valuation upon which earnings should be based, there is what is often called the present or existing value, or cost of reproduction less depreciation, which must be given consideration in determining the valuation in question. Especially is this the case in plants the rates for gas service from which have been ample to cover operating expenses, including depreciation, and a fair amount for interest and profits, but the amount collected for depreciation has not been used as it should be and set aside for replacing portions of the plant discarded because of their becoming obsolete, inadequate or worn out, but on the contrary has been distributed to the stockholders in the shape of dividends.

Depreciation should be considered as the amount that must be regularly set aside to cover all portions of the plant that are discarded because of wear and tear, inadequacy, obsolescence and general unavoidable decay. It is an operating expense and should be borne by the customers through the rate paid by them for the service rendered by the utility. But as it is paid by the customers it must be set aside by the company and used when needed for the renewal of worn out and useless portions of the entire system, and under no circumstances should the cost of such renewals be made an additional charge to the capital or construction account except when the replaced equipment is of greater capacity than that which is taken out. Care must also be taken that the operating charge properly known as depreciation shall not be used for ordinary maintenance and repair. Actual additions and extensions to plant which should be charged to the construction or capital account, replacement of equipment set aside as a result of depreciation, and ordinary repair and maintenance costs, must all three be most carefully separated and completely segregated in the engineering records as well as the financial accounts.

If construction, depreciation, repair and maintenance accounts are not so considered and depreciation is borne by the customers as a result of being included in the operating expense, and such deprecia-

tion fund is not used to keep the plant in its proper condition, but is paid in dividends to the stockholders, it is practically equivalent to the payment of dividends out of capital. Rates of service should be such as to include a reasonable charge for depreciation, and if the rates are such as to do this and the amount necessary to cover depreciation is not used as it should be, it cannot mean anything but that the money, either in surplus or dividends is going to the stockholders instead of being used for the purpose intended.

An allowance for depreciation obligates the company to use of this money in keeping the plant in thorough operating condition, and if it is not so used but is turned over to the stockholders, it simply means that a part of their capital is being returned to them, thereby reducing the investment in the plant. If this is the case, as a matter of fact the investment is so reduced and there should be corresponding reduction made in the actual investment presumably represented by the original or cost of reproduction new. In such instances, if the owners of the property, instead of keeping up the plant as they should by the proper use of the annual depreciation charge, have appropriated for their own use the money contributed by their customers, the annual depreciation should each year be deducted from the valuation of the plant which might otherwise be obtained.

Depreciation, like interest, continues constantly and is always present. Every part of the physical property of any system exclusive of the land begins to depreciate when the plant is completed and ready for operation; therefore, the depreciation charge should be constant. It of course may be that such depreciation covering a number of years may be arrived at as an average for a long period, and it will not be necessary to expend the average each year. This is of minor importance, however, providing the methods by which the depreciation charges are obtained are sound and reasonable.

Two methods are in common use for determining depreciation. The first is known as the straight line method, which involves determining the probable

ultimate life of each element of the system, consideration also being given to the value of the discarded element as junk at the end of the period. In the straight line method it is assumed that during the entire life of each element of the plant the depreciation is uniform, which of course is not ordinarily the case as the rate of depreciation of a plant as a whole is much more rapid during the latter part of its life than during the first years of its use. Fairness to customers, however, in the different years, as well as safety to investors, indicates clearly the wisdom and correctness in considering the depreciation uniform throughout the entire life of each portion of the plant.

The second method of determining depreciation is upon the assumption that each year an amount is to be set aside and invested at compound interest so that this amount plus interest will be available to cover the cost of the replacement needed at the end of the period when the device or element is discarded, and replacement necessary. The so-called rates of depreciation will naturally be less in the latter method than in the former, since it is assumed that the depreciation fund will earn interest from the end of the first year or even shorter period. If we consider the life of some portions of a plant to be between twenty and thirty years, with the latter method it is necessary for us to in advance assume an interest rate which will continue during this entire period and this is an assumption which, judged by the last twenty-five year period, is hardly justifiable.

It may very properly be said that neither method exactly corresponds to actual experience. At the same time the rate of depreciation is something that must be carefully estimated for each individual plant and the data required compiled from the best information obtainable from those who have been in charge of construction and operation preferably for a number of years. If new devices are constantly being perfected and introduced rates of depreciation will be high due to the fact that older apparatus will become obsolete and inadequate at an early date. On the

other hand, if the different portions of the plant are not subject to change as a result of improved or modified methods or distribution, rates of depreciation will be low, providing, of course, that wear and tear and ordinary deterioration are not severe with a reasonable expenditure for ordinary replacement and maintenance.

Intangible Elements of Value.

In determining the proper valuation, therefore, the original cost, cost of reproduction new, present value as affected by depreciation should all be taken into consideration. They are not the only elements, however, although they are usually the most readily determined: One element of value often suggested is that of "good will." The good will of a business is an asset that cannot be ignored in determining the valuation of a property, provided the element of good will is inherent in the business of a public service corporation which may have a practical monopoly. One of the most comprehensive and generally accepted definitions of good will is by Judge Story:

"Good will may properly enough be described to be the advantage or benefit which is acquired by an establishment, beyond the mere value of the capital stock, funds, or property employed therein in consequence of the general public patronage and encouragement which it receives from constant or habitual customers on account of its local position or common celebrity or reputation for skill, affluence, punctuality, or from other accidental circumstances or necessities, or even from ancient partialities or prejudices."

Judge Hough must have had this definition of good will in mind in the case of Consolidated Gas Company vs. The City of New York, in which he says:

"There is nothing in the nature of the business enabling it to acquire good will in the property sense or indeed in any other. It is required by law to furnish gas to all demanding it within a certain distance of the mains; and it owns the mains, service pipes and meters. What induces a customer to remain with this company, its successor or vendee? Nothing that I can imagine, except a desire to avoid the nuisance of street digging in front of his house; a digging, however, entailing no expense upon him. Yet even this nuisance is in all human probability impossible of occurrence because of the beneficially monopolistic character of defendant's present occupancy of the streets of this city * * *. Finally, this claim of good will seems to forget that for many years the price of distribution of complainant's gas has been regulated by law. A citizen is entitled to have a clean street before his house because he pays taxes, inter alia, for that purpose. He is much more entitled to have complainant's gas in his house because the company must give it to him if he pays for it. I think it apparent that the conceivable good will of a gas company in this city is about equal to that of the street cleaning department of the municipal government."

The public service corporation operating where competition exists may have an element of good will in its valuation, but it is certainly of little, if any, consequence where the public under any circumstances must obtain its service, if at all, from a single corporation.

In a somewhat similar manner may the assumed value of franchises be considered in determining the valuation of the property of a public service corporation. Based upon court decisions, the principal element in the value of a franchise is the earning capacity of the property of the corporation in connection with which a franchise is necessary. Viewed from this standpoint, since the earnings must be directly dependent upon the rates charged for service, it is evident that to include the value of a franchise as an element in determining rates develops an almost impossible situation. A franchise which is not exclusive can have no real value from any standpoint and is in reality little more than a permit to carry on the business and to do necessary work upon public property. As an element of value, even in the sale or transfer of the property, it is questionable whether such a franchise would be given serious consideration. If, however, a franchise is exclusive and is owned by a company, it may be considered of value and would be rightfully considered a part of the entire system if the business were sold. On this assumption it is proper to consider a franchise as a part of the taxable property of the company. On the other hand, while there may be some cases where the valuation of a property may rightfully include a certain sum as the value of the franchise, yet when this value must depend upon the rates for which service is rendered, it is difficult to see how it should be considered as a part of such valuation.

There is an element of value that must be taken into consideration in determining the valuation of a property and which is sometimes referred to as "Going Value." This is sometimes covered by an allowance usually in percentage to cover the differ-

ence between the cost of the physical property and the value of the completed system in operation providing service to its customers and possessing numerous valuable contracts for giving service in the future. Going value is of an intangible character and may be estimated in some instances by estimating the cost of developing the business which the company enjoys at any particular time. The data naturally is rarely obtainable to indicate the money actually spent by the company to obtain its business, since in recent years the period of time during which public service corporations have been ready for operation and yet not actually engaged in providing service, approximately at least up to their normal capacity, has usually not exceeded one or two years. When the earnings of a public service corporation have not been sufficient to meet reasonable expenditures for the development of its business and to cover operating expenses, depreciation and a reasonable return on the investment, the losses incurred in building up the business must be considered as one of the elements to be included in appraising a plant for the purpose of determining the proper rates for service.

Probably the most concise statement in this connection is from the decision of Justice Brewer in a most noteworthy decision in the case of the National Water Works Company vs. Kansas City in connection with the valuation of a waterworks which had been taken by the municipality:

"The original cost of the construction cannot control, for 'original cost' and 'present value' are not equivalent terms. Nor would the mere cost of reproducing the waterworks plant be a fair cost, because that does not take into account the value which flows from the established connections between the pipes and the buildings of the city. It is obvious that the mere cost of purchasing the land, constructing the buildings, putting in the machinery, and laying the pipes in the streets—in other words, the cost of reproduction—does not give the value of the property as it is to-day. A completed system of waterworks, such as the company has, without a single connection between the pipes in the streets and the buildings of the city, would be a property of much less value than that system connected, as it is, with so many buildings, and earning, in consequence thereof, the money which it does earn. The fact that it is a system in operation, not only with a capacity to supply the city, but actually supplying many buildings in the city—not only with a capacity to earn, but actually earning—makes it true that 'the fair and equitable value' is something in excess of the cost of reproduction."

In general it may be said that the courts have with few exceptions held that going value is an im-

portant and valuable consideration in determining a fair valuation for the property of a public service corporation devoted to public service. The difficulty, however is in obtaining a fair and proper figure in any given case. Competition may at any time seriously affect any estimate which may be made of the probable value of a going concern as contrasted with the physical plant without customers or contracts. It is probably most satisfactory to treat this matter primarily from the standpoint of the excess value of the completed system in operation over and above the original cost, cost of reproduction new, or cost of reproduction less depreciation, of the physical plant.

If this is done, however, such excess value of the completed operating system must be considered entirely separate from a percentage which may properly be considered as approximately the contractor's profit who undertakes to design, build and supervise the complete construction of an entire system, turning it over ready for operation to its owners.

The true value of a thing has been defined as the price upon which a purchaser and a seller mutually agree and at which figure an actual transaction takes place. If an existing plant and system were to be purchased and the owners were willing to sell at all, they would surely take into consideration what it would cost the purchaser to duplicate, not only the physical plant, but obtain all of the business enjoyed by them, and the prospective purchasers would surely consider what it would cost them independently to install a plant of equal general efficiency and usefulness, including the business developed and under control of the prospective sellers. In the long run, the true value must be the capitalization of an assured income. A certain portion of this value is represented by tangible property and the remainder, if there be any, must be regarded as primarily traceable to the earning power of the business.

Gross Revenue, Cost of Operation and Quantity of Gas Manufactured and Sold.

Gas being a commodity, it is manufactured, distributed and sold to those who use it. As manufac-

tured and sold it is divided into units which are usually 1000 cubic feet. The operating expenses may be properly divided into manufacturing, including fuel, distribution, general expenses, taxes and licenses and depreciation. For any period the unit cost may in a general way be obtained by dividing the total expense by the total quantity sold and the average cost per 1000 cubic feet is thereby obtained. Similarly, the unit cost for fuel and other station costs, for distribution, taxes and licenses, depreciation and general expenses, may also be determined. It is of importance also to know the relation between the total gas made and delivered to the holders and the quantity actually sold as per customers' meters. In this manner definite data is obtained for the leakage and the reduction in volume of the gas as measured by the station meters and by customers' meters.

The operating expenses can be definitely divided under two heads, fixed and variable. The fixed costs should include all expenses that are independent of the quantity of gas made but which remain practically constant whether the plant is operated at or near its full output, or at a fraction of this. Variable expenses include those costs that vary with the output and may be considered as of little consequence if gas is not made. Naturally, these two classes of costs are dependent and may vary widely.

It is not always possible to make a definite segregation of these fixed and variable expenses, but when necessary, approximate subdivisions may be made of expenditures involving both. The cost of manufacture per 1000 cubic feet depends largely upon the total amount of gas made, decreasing as the volume of production increases and increasing as the quantity made decreases, and a slight reduction in the sales will materially increase the cost of manufacture per 1000 cubic feet. The greater the sales the smaller is the cost of manufacture, but not in the same proportion for the total cost of service, when we include the distribution to customers' meters, and it is therefore of the greatest importance in discussing the rates for which gas may be sold to clearly distinguish between

the cost of gas in the holder and when delivered to the customers' premises.

In general, it may be said that very large consumers involve a smaller cost per 1000 cubic feet than small consumers. The question naturally arises, should this difference in the cost of service to various classes of consumers be taken into consideration in determining the proper rates for service? The same rate for all is a term that is often much more beautiful in the abstract than when absolutely applied. Sometimes such a policy, when it means the same rate for all regardless of both cost and the effect upon the growth of the business, is a violation of sound business principles and decidedly against public policy. Often, uniform rates for a very large territory with the same class of customers may fulfill all requirements, but it does not follow that the best interests of all concerned are conserved where, in deciding upon a rate, it is made uniform for every customer. Very closely related to the fixed and variable expenses are capacity and output expenses, and in some respects they more clearly define the costs involved in the two classes of expenditures. There is a term known as "Consumer's charge" which may ordinarily be included as a part of the fixed costs of operation, and such expenses are directly proportional to the number of consumers taking service.

These considerations usually lead to the establishment of what is known as minimum rates or a minimum bill, which should be high enough to cover the cost to the company of the consumer independent of the quantity of gas which may be delivered to and used by him. Many times the actual consumption of gas for small customers is not a great factor in the cost of rendering service and from this standpoint the establishment of minimum rates would seem to be sound and thoroughly justifiable.

While no rates should be greater than the value of the service rendered, it is not necessarily equitable to charge the same rates to all regardless of the actual cost, and, as the cost of manufacture per 1000 cubic feet depends very largely upon the magnitude of the

output, such a policy might not only tend to discourage large consumption but to actually increase the cost to small consumers. It may even happen that large quantities of gas should be sold at even less than enough to yield the regular rate of return rather than these quantities should not be sold at all.

This phase of the situation is often entirely neglected, not only by gas companies, but by those responsible for the adjustment of rates on an equitable basis. Failure to consider such opportunities often results in losses of great magnitude and thereby results in increased cost to all consumers. A wise and far-seeing management having all the information available can usually treat such matters most effectively by taking into consideration the location of such large customers and the character and magnitude of service required.

In this connection it is of interest to discuss the advisability of charging a higher rate for gas when used for lighting purposes than when used for heating and cooking. As a matter of fact by far the largest part of the consumption of gas is for purposes other than lighting, and this probably accounts for the fact that the rates for the two classes of service differ. In addition there is of course the fact that the use of gas for lighting concentrates the maximum demand somewhat similar to, although of less magnitude than, the use of electricity for lighting. Gas is stored in the holder with little additional cost as compared with the storage of electricity, so that the peake load character of the demand is decidedly of smaller consequence, as regards the maximum capacity of the plant, than in the generation and consumption of electrical energy. Whether use for lighting or fuel on the customers' premises the gas is used in the same way and from the same service pipes, and unless there is a very great difference in the magnitude of consumption in the two cases it is difficult to see where lies the difference in the cost of service in the two instances.

Rate of Return on Investment.

What is an adequate return on the investment for a public utility corporation is a question that has

been given the greatest consideration, not only by the courts of the country, but by Federal, State, Municipal and other commissions. In the U. S. Supreme Court decision in the Consolidated Gas Case of New York, it is stated that:

"There is no particular rate of compensation which must in all cases and in all parts of the country be regarded as sufficient for capital invested in business enterprises. Such compensation must depend greatly upon circumstances and locality; among other things the amount of risk in the business is a most important factor as well as the locality where the business is conducted and the rate expected, and usually realized there upon investments of a somewhat similar nature with regard to the risk attending them."

In considering such a matter it is evident that under present industrial conditions the best interests of society as a whole are subserved when the share of each factor of production is high enough to cause a free and natural distribution of capital and business ability as well as labor into all utilities. When wages and the returns on investment are not high enough to be attractive then in such a utility there must be a decline. No utility will be furnished unless the factors making such a utility attractive are present. Wages must be high enough to attract competent workmen, salaries sufficient to engage successful superintendents and managers, interest on the capital legitimately invested must be earned, and, in general, the return must be high enough to induce investors to assume all risks and responsibilities that are involved in their operation. From this it naturally follows that the rate fixed for service rendered by public utility corporations must in the long run be high enough to attract all of the elements necessary for the production of that service, taking into consideration the wages to be paid, the cost of superintendence and management, the interest on the investment and a reward for the risk and responsibility entailed.

Unfortunately, however, many who have been most active in the development of public utility corporations in recent years have been interested therein primarily from the speculative standpoint rather than as legitimate investors. Speculation necessarily involves risk. An investment is generally considered reasonably safe. A high rate of return rarely compensates when there is a danger of losing a part or all of the principal. Cus-

tomers of a public service corporation have a right to demand that the rates they pay for service shall be only adequate to give a proper return upon the necessary investment required, and not so high as to make the return, upon a reasonably safe investment, of the magnitude usually demanded in a pure and unadulterated speculative venture.

The tendency toward legislation affecting public utilities, the creation of wise and powerful commissions and the enactment of numerous laws not only regulating but actually protecting public service corporations constitute a definite reduction in the risks and hazards formerly existing in many instances.

In public utilities capital cannot be turned over as frequently as in commercial enterprises, due to the relatively large proportion of the fixed investment. Legislative regulation of public utilities through commissions may in some respects be detrimental to financial operators who endeavor to evade their obligations under the common law and who try to profit by the manipulation of capital rather than through legitimate, effective and economical operation of their plants. Such regulation, however, cannot possibly result in permanent injury to the great majority of investors and to the utilities themselves if honestly applied and administered with ordinary care. An investment along the lines of and in the spirit of such laws as those which have been upheld by the courts assures, in every case, a reasonable return on a fair valuation of the plant.

While public utilities are subject to many conditions that tend to increase the risks under which their business is carried on, they are also afforded a great deal of protection that is of the greatest value to investors. Many are natural monopolies engaged in furnishing service that has practically become a necessity and for which, at least at the present time, there are no effective substitutes. An investment in a public utility corporation wisely directed, while involving a greater risk than if the same money was placed in good mortgages, should not involve hazards equal to investments in ordinary competitive enterprises.

The profits of a business consists of the balance between the sum of expenses and the total income of the business. It is the difference between the sum representing the operating expenses, which includes rent, salaries and wages, fuel, taxes, interest, depreciation, and the total gross revenue. This difference is the last share of the total income and unlike all the other shares is not fixed. It simply consists of what is left after all other claims have been completely satisfied. Salaries, wages, rents and interest are usually fixed at a certain amount per annum in advance and are paid out of the gross receipts. The amount left after these shares have been satisfied belongs to the owner and represents his share of the profits of the business. Interest and profits, notwithstanding the indeterminate quality of the latter, are usually measured upon the same basis and are included in what is generally known as the adequate return on the investment.

The difference between the gross revenue and the aggregate of the legitimate operating expenses for a single year is the sum usually considered as the net revenue or return upon the investment. As the gross revenue and the operating expenses are for many reasons subject to wide variations, it is manifestly unsafe to determine rates upon a single year's business. A most valuable method is to consider the gross and net return per dollar invested for a number of years of operation. By doing this the additional investment in the plant from year to year as well as the growth of the business, both from the standpoint of gross revenue and operating expenses, is obtained. In fact, many important conditions affecting the company are brought to light in such an analysis.

The value of ascertaining how much a dollar earns, both gross and net, is due to the important differences between public service corporation and ordinary commercial enterprises. In most private undertakings the operating expenses can usually be greatly reduced or even practically eliminated if for any reason the gross receipts are reduced so as to make the business unprofitable. But this cannot be done in the case of public service corporations, who must

under the law provide service to all within the territory covered by the distribution system provided who request it. While the investment in the private enterprise may be greatly restricted or even withdrawn, such is not the case with a public service corporation. The relatively large investment in plant, equipment and other property of the public service corporation means that the interest and other fixed charges go on at about the same rate whether the plant is operated and its output sold or not. As a result, the public service corporation is compelled under certain adverse conditions to keep its plant in operation even if the actual operating expenses are greater than the gross receipts.

A complete investigation of all conditions existing for a number of years is therefore of much greater value than confining the data upon which rates are fixed to a single year's business. The public service corporation should not be a free agent to do absolutely as it pleases, and on account of this restriction certain reasonable protection is desirable for all concerned. Free and unrestricted competition between private enterprises may be of the greatest benefit to the public. Experience shows, however, that this is not the case with public service corporations where the commodity furnished by them is a necessity and the character of the business such as to be a natural monopoly. Competition in such cases inevitably results in a bitter struggle for supremacy and rates so low as to be inadequate to maintain the proper quality of service and yield a return sufficient to make extensions commensurate with the growth of the community. Two or more distinct and separate corporations providing the same public commodity are not likely to remain separate very long. Sooner or later it will be self-evident that the service rendered by them independently can be more cheaply, effectively and in a better manner provided by a single operating system under one management. As a result it is an invariable rule that competition which is often thought to be preventive of excessive rates becomes ultimately the direct cause of what is relatively extortionate rates

of service, when compared with what the rates should be if destructive and temporary competition is prevented and the rates equitably fixed under proper control by a wise commission.

Again, a modification of rates at frequent intervals is undesirable, as it renders unstable and therefore the more hazardous the entire business of rendering service. Everything of every character tending to eliminate uncertainties and general risks on the one hand, and which provides protection and wise regulation on the other, definitely increases the security of the investment, the required return upon which is thereby reduced, the general stability of the enterprise is materially improved, resulting not only in reduced rates but improved quality of service.

Conversely, the rate of return on the investment and consequently the rates of service must be correspondingly high as long as unrestricted competition threatens, and extraordinary risks involving a possible loss of a large fraction of the investment confronts, those interested in the progress and development of public service corporations in general.

In the end, all costs of every character, such as litigation and other expenses, incident to the establishing of rates, whether paid out of public funds or by the public service corporations, come out of the customers' pockets, as taxpayers in one instance and as consumers forced to pay the company for service in the other. The constant danger to the company of having its investment as well as its gross revenue seriously impaired due to the fixing of rates upon other than a sound and equitable basis involves that much extra hazard in conducting its business, necessarily requires an increased return upon the investment on account of such menace, and in turn will ultimately result in rates higher than they should be.



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